

10/582277

SEQUENCE LISTING

AP9 Rec'd PCT/PTO 10 JUN 2005

<110> Nielsen, Allan Kent
Rasmussen, Michael Dolberg

<120> A cell with improved secretion mediated by MrgA protein or
homologue

<130> 10527.204-US

<160> 16

<170> PatentIn version 3.3

<210> 1

<211> 815

<212> DNA

<213> Bacillus subtilis 168

<220>

<221> misc_feature

<222> (201)..(659)

<223> MrgA encoding sequence

<400> 1

```

aagaatttgc gatacccgat cggaagggc atcaagctca ccctgctgtt ccgatcgctt      60
tttccttggt ctgctgga gtctatcctg aagaaaaagc tattcagctg atctaaatta      120
taattattat aatttagtat tgatttttat ttagtatatg atataattaa gtcaacagat      180
cacaaggagg acgttatctt atgaaaactg aaaacgcaa aacaaatcaa acattagttg      240
agaattcact gaacacacaa ttatcaaact ggtttctttt atactctaag ctccaccgtt      300
tccattggtg tgtgaaaggg cctcatttct ttacattgca cgagaaattt gaagaacttt      360
atgaccatgc ggctgaaaca gtggatacca tcgctgagcg cctgctggcg attggcggac      420
agcctgttgc cacagtgaag gaatacactg agcatgcatc tatcacagac ggcggaacg      480
aaacatcagc atcagaaatg gtacaagcat tggtaaacga ctacaaacaa atcagcagcg      540
aatctaaatt cgtgatcggc ctggctgaag aaaatcaaga caatgcgaca gcggacttgt      600
ttgtcggatt aattgaagaa gttgaaaaac aagtgtggat gctttcctct tatttaggg      660
aacaaaaaag ctgaacctta atcgggttca gctttttgtt ttttcttagc ttgaactgct      720
ttctgtctgc ttggtcagtg ttgcgttcaa cgttttcggt tttcccttgc gcagcacttg      780
gattgttggt ttatctccga cttttaagtc tttgt                                     815

```

<210> 2

<211> 153

<212> PRT
<213> Bacillus subtilis 168

<220>
<221> PEPTIDE
<222> (1)..(153)
<223> MrgA protein

<400> 2

Met Lys Thr Glu Asn Ala Lys Thr Asn Gln Thr Leu Val Glu Asn Ser
1 5 10 15

Leu Asn Thr Gln Leu Ser Asn Trp Phe Leu Leu Tyr Ser Lys Leu His
20 25 30

Arg Phe His Trp Tyr Val Lys Gly Pro His Phe Phe Thr Leu His Glu
35 40 45

Lys Phe Glu Glu Leu Tyr Asp His Ala Ala Glu Thr Val Asp Thr Ile
50 55 60

Ala Glu Arg Leu Leu Ala Ile Gly Gly Gln Pro Val Ala Thr Val Lys
65 70 75 80

Glu Tyr Thr Glu His Ala Ser Ile Thr Asp Gly Gly Asn Glu Thr Ser
85 90 95

Ala Ser Glu Met Val Gln Ala Leu Val Asn Asp Tyr Lys Gln Ile Ser
100 105 110

Ser Glu Ser Lys Phe Val Ile Gly Leu Ala Glu Glu Asn Gln Asp Asn
115 120 125

Ala Thr Ala Asp Leu Phe Val Gly Leu Ile Glu Glu Val Glu Lys Gln
130 135 140

Val Trp Met Leu Ser Ser Tyr Leu Gly
145 150

<210> 3
<211> 8644
<212> DNA
<213> Artificial sequence

<220>

<223> Plasmid pDG268neo

<400> 3

aacaaaattc tccagtcttc acatcggttt gaaaggagga agcggaagaa tgaagtaaga	60
gggattttttg actccgaagt aagtcttcaa aaaatcaaat aaggagtgtc aagaatgttt	120
gcaaaacgat tcaaaacctc ttactgccg ttattcgctg gatttttatt gctgtttcat	180
ttggttcttg caggaccggc ggctgcgagt gctgaaacgg cgaacaaatc gaatgagctt	240
acagcaccgt cgatcaaaag cggaaccatt cttcatgcat ggaattgggtc gttcaatacg	300
ttaaaacaca atatgaagga tattcatgat gcaggatata cagccattca gacatctccg	360
attaaccaag taaaggaagg gaatcaagga gataaaagca tgtcgaactg gtactggctg	420
tatcagccga catcgatatc aattggcaac cgttacttag gtactgaaca agaatttaaa	480
gaaatgtgtg cagccgctga agaatatggc ataaagggtca ttgttgacgc gcggccgcgg	540
atccatacac aaaaaaacgc tgtgcccttt aaccgcacag cgttttttta ttgattaacg	600
cgttgccgct tctgcgttaa caagtccgct tccatacaag ttcgtgcttc ctaaactagt	660
tgccgtattc tttagatgat ttcgaatttg tacattagac caagatgggt tcttttgttt	720
aacaagggcg gccgcacctg caacatgagg agtagccatc gatgtaccgt ttaagctggc	780
atatgttgaa cctgggtatg tgctctgcac gtttaccctg ggtgcgacaa tgtcaaggcc	840
tgcgccatac tgtgaaaagc tagcgcggtt gttgttttga tcagtagctc cgactgccat	900
tgcgttcgca tagcgcgccg gatagctgat tgagcctgca cctgaattcc cagatgccgc	960
tacaacaaga acgcctctag aagtcgcgct attaacagct tgctcgagtg tggcacttgg	1020
cgaagggtt cctaaactca aattagcaac gtgcatgcc a ttgttccctg cccattccaa	1080
tccttgggca atcgagctga ccgaacctga accgctcgcc cctaggactt taacagcgta	1140
tagctcagcg ctcggcgcta cgccaagaac gccaatcgaa ttgttttaaag cagcgatcgt	1200
cccggccaca tgcgtgccat gccattccc atcttgagtc gacggttccc ctggtacaaa	1260
gcttgcgcca ccacgaatat ttagatctgg atgagtggat atccctgtat cgaggacagc	1320
aacttttaca ccagaacctg tcaatccacg gttatgggca gctgggggtt gcacacggct	1380
aattcccat ggtaccgatt gcgccattgt cgttacttct gcatcctctt caatataaga	1440
aatcgctgga tcgagttcaa gcgcgtccac atcttctggg cttaaactcaa cggataaaac	1500
aggaatcggt tcaaattcat gaagcaattc aatttcgact tcctcttcct cagagagaat	1560
ggcgacctcg tcatttgcct ctacttggtc taaaaactca ctgacagctt cctgctcatt	1620

aaagccaatt	aaatattttt	cttttgcttc	ttcagcagcc	gatgcgatcg	atgaactaaa	1680
agcaacagaa	atgagtagtg	cggtgcttgc	gacaattttc	cccaacgggt	tcttcattcg	1740
gtttccctcc	tcatttttat	agagctccat	aatacataat	tttcaaactg	ataaaatgat	1800
ttttcataaa	tccattagac	ggtgcaaata	tatgttttta	atgttcttcg	tttttaggca	1860
tccctccttt	caagataaat	aatttataca	ctattctatt	ggaatcttaa	tcattccaat	1920
agaaaaatat	gtaatgatta	taaataagtc	gcttcttatt	ataaatatat	ttacatattc	1980
atttaatact	acatcatggt	aggtatagta	aggctatcaa	gggtgtctta	atttctactt	2040
gtaacaatgt	attggcatat	tatatattga	attgagaaaa	ttaaatacag	cgataattca	2100
catgaacaag	ttcattggta	gttatatttt	caaattttca	aggttgtgct	tgtatgtcat	2160
tctatagtta	gataagcatt	tgaggtagag	tccgtccgaa	tatatttgta	atctgaagaa	2220
ggttcaaaca	tatttctata	taacgtattc	tttttttgta	gttcttactt	ttgaggggcg	2280
ttacaattca	aagatattat	ctttaattaa	gcttaacatt	aataattctt	caattgcaac	2340
aaaaaaagca	cttttatcta	aggtttcatt	ttacgtttcg	agggcccctc	cattttctta	2400
tacaaattat	attatacata	tcagtaaaat	aatgtcaacc	cccctttatt	cctttttttt	2460
acacagcgga	cagtctggac	agcaggccct	taaggccaat	tctcatgttt	gacagcttat	2520
catcggcaat	agttaccctt	attatcaaga	taagaaagaa	aaggattttt	cgctacgctc	2580
aaatccttta	aaaaaacaca	aaagaccaca	ttttttaatg	tggctctttat	tcttcaacta	2640
aagcacccat	tagttcaaca	aacgaaaatt	ggataaagtg	ggatattttt	aaaatatata	2700
tttatgttac	agtaatattg	acttttaaaa	aaggattgat	tctaatagag	aaagcagaca	2760
agtaagcctc	ctaaattcac	tttagataaa	aatttaggag	gcataatcaa	tgaactttta	2820
taaaattgat	ttagacaatt	ggaagagaaa	agagatatatt	aatcattatt	tgaaccaaca	2880
aacgactttt	agtataacca	cagaaattga	tattagtgtt	ttataaccgaa	acataaaaaca	2940
agaaggatat	aaattttacc	ctgcatttat	tttcttagtg	acaaggggtga	taaactcaaa	3000
tacagctttt	agaactgggt	acaatagcga	cggagagtta	ggttattggg	ataagttaga	3060
gccactttat	acaatttttg	atggtgtatc	taaaacattc	tctgggtatt	ggactcctgt	3120
aaagaatgac	ttcaaagagt	tttatgattt	atacctttct	gatgtagaga	aatataatgg	3180
ttcggggaaa	ttgtttccca	aaacacctat	acctgaaaat	gctttttctc	tttctattat	3240
tccatggact	tcattttactg	ggtttaactt	aaatatcaat	aataatagta	attaccttct	3300
accattatt	acagcaggaa	aattcattaa	taaaggtaat	tcaatatatt	taccgctatc	3360

tttacaggta catcattctg tttgtgatgg ttatcatgca ggattgttta tgaactctat	3420
tcaggaattg tcagataggc ctaatgactg gcttttataa tatgagataa tgccgactgt	3480
actttttaca gtcgggttttc taatgtcact aacctgcccc gttagttgaa gaagggttttt	3540
atattacagc tccagatcct ctacgccgga cgcacgtgg ccggcatcac cggcgccaca	3600
ggtgcggttg ctggcgcccta tatcgccgac atcaccgatg gggaagatcg ggctcgccac	3660
ttcgggctca tgagcgcttg tttcggcgctg ggtatggtgg caggccccgt ggccggggga	3720
ctgttgggcg ccatctcctt gcatgcacca ttccttgcg cggcggtgct caacggcctc	3780
aacctactac tgggctgctt cctaatgcag gagtcgcata agggagagcg tcgacatgga	3840
tgagcgatga tgatatccgt ttaggctggg cggtgatagc ttctcgttca ggcagtacgc	3900
ctcttttctt ttccagacct gagggaggcg gaaatggtgt gaggttcccg gggaaaagcc	3960
aaataggcga tcgcgggagt gctttatttg aagatcaggc tatcactgcg gtcaatagat	4020
ttcacaatgt gatggctgga cagcctgagg aactctcgaa cccgaatgga aacaaccaga	4080
tatttatgaa tcagcgcggc tcacatggcg ttgtgctggc aaatgcaggt tcatcctctg	4140
tctctatcaa tacggcaaca aaattgcctg atggcaggta tgacaataaa gctggagcgg	4200
gttcatttca agtgaacgat ggtaaaactga caggcacgat caatgccagg tctgtagctg	4260
tgctttatcc tgatgatatt gcaaaagcgc ctcatgtttt ccttgagaat tacaaaacag	4320
gtgtaacaca ttctttcaat gatcaactga cgattacctt gcgtgcagat gcgaatacaa	4380
caaaagccgt ttatcaaatac aataatggac cagacgacag gcgtttaagg atggagatca	4440
attcacaatc ggaaaaggag atccaatttg gcaaaacata caccatcatg ttaaaaggaa	4500
cgaacagtga tgggtgaacg aggaccgaga aatacagttt tgttaaaaga gatccagcgt	4560
cggccaaaac catcggctat caaaatccga atcattggag ccaggtaaata gcttatatct	4620
ataaacatga tgggagccga gtaattgaat tgaccggatc ttggcctgga aaaccaatga	4680
ctaaaaatgc agacggaatt tacacgctga cgctgcctgc ggacacggat acaaccaacg	4740
caaaagtgat ttttaataat ggcagcgcgc aagtgcccg tcagaatcag cctggctttg	4800
attacgtgct aaatggttta tataatgact cgggcttaag cggttctctt cccattgag	4860
ggcaaggcta gacgggactt accgaaagaa accatcaatg atggtttctt tttgttcat	4920
aatcagaca aaacttttct cttgcaaaaag tttgtgaagt gttgcacaat ataaatgtga	4980
aatacttcac aaacaaaaag acatcaaaga gaaacatacc ctgcaaggat gctgatattg	5040

tctgcatttg	cgccggagca	aaccaaaaac	ctggtgagac	acgccttgaa	ttagtagaaa	5100
agaacttgaa	gattttcaaa	ggcatcgtta	gtgaagtcac	ggcgagcgga	tttgacggca	5160
ttttcttagt	cggtaacaat	cctcgttaaa	ggacaaggac	ctgagcgga	gtgtatcgta	5220
cagtagacgg	agtatactag	tatagtctat	agtccgtgga	attattatat	ttatctccga	5280
cgatattctc	atcagtga	tccagctgga	gttcttttagc	aaattttttt	attagctgaa	5340
cttagtatta	gtggggccgc	tgataattac	taatactagg	agaagttaat	aaatacgtaa	5400
ccaacatgat	taacaattat	tagaggtcac	cgttcaaaat	ggatatgcgtt	ttgacacatc	5460
cactatatat	ccgtgtcgtt	ctgtccactc	ctgaatccca	ttccagaaat	tctctagcga	5520
ttccagaagt	ttctcagagt	cggaaagttg	accagacatt	acgaactggc	acagatggtc	5580
ataacctgaa	ggaagatctg	attgcttaac	tgcttcagtt	aagaccgaag	cgctcgtcgt	5640
ataacagatg	cgatgatgca	gaccaatcaa	catggcacct	gccattgcta	cctgtacagt	5700
caaggatggg	agaaatgttg	tcggtccttg	cacacgaata	ttacgccatt	tgctgcata	5760
ttcaaacagc	tcttctacga	taagggcaca	aatcgcatcg	tggaacgttt	gggcttctac	5820
cgatttagca	gtttgataca	ctttctctaa	gtatccacct	gaatcataaa	tcggcaaaat	5880
agagaaaaat	tgaccatgtg	taagcggcca	atctgattcc	acctgagatg	cataatctag	5940
tagaatctct	tcgctatcaa	aattcacttc	caccttccac	tcaccggttg	tccattcatg	6000
gctgaactct	gcttcctctg	ttgacatgac	acacatcatc	tcaatatccg	aatagggccc	6060
atcagtctga	cgaccaagag	agccataaac	accaatagcc	ttaacatcat	ccccatattt	6120
atccaatatt	cgttccttaa	tttcatgaac	aatcttcatt	ctttcttctc	tagtcattat	6180
tattgggtcca	ttcactattc	tcattccctt	ttcagataat	tttagatttg	cttttctaaa	6240
taagaatatt	tgagagcac	cgttcttatt	cagctattaa	taactcgtct	tcctaagcat	6300
catgggtctca	cttttccact	ttttgtcttg	tccactaaaa	cccttgattt	ttcatctgaa	6360
taaatgctac	tattaggaca	cataatatta	aaagaaaccc	ccatctattt	agttatttgt	6420
ttagtcactt	ataacttta	cagatggggg	ttttctgtgc	aaccaatttt	aagggttttc	6480
aatacttta	aacacataca	taccaacact	tcaacgcacc	tttcagcaac	taaaataaaa	6540
atgacgttat	ttctatatgt	atcaagataa	gaaagaacaa	gttcaaaacc	atcaaaaaaa	6600
gacacctttt	caggtgcttt	ttttatttta	taaactcatt	ccctgatctc	cccatactcc	6660
tccaatccaa	agctatttag	aaagattact	atatactcaa	acaggcggtg	accggcctct	6720
tcatacggga	tgcgcgcgac	cttcagcatc	gccggcatgt	ccccctggcg	gacgggaagt	6780

atccagctcg aggtcggggc gcgttgctgg cgtttttcca taggctccgc cccctgacg	6840
agcatcacia aaatcgacgc tcaagtcaga ggtggcgaaa cccgacagga ctataaagat	6900
accaggcggtt tccccctgga agtccctcg tgcgctctcc tgttccgacc ctgccgctta	6960
ccggatacct gtccgccttt ctcccttcgg gaagcgtggc gctttctcat agctcacgct	7020
gtaggtatct cagttcgggtg taggtcggtc gctccaagct gggctgtgtg cacgaacccc	7080
ccgttcagcc cgaccgctgc gccttatccg gtaactatcg tcttgagtcc aaccggtaa	7140
gacacgactt atcgccactg gcagcagcca ctggtaacag gattagcaga gcgaggtatg	7200
taggcgggtgc tacagagttc ttgaagtggg ggcctaacta cggctacact agaaggacag	7260
tatttggtat ctgcgctctg ctgaagccag ttaccttcgg aaaaagagtt ggtagctctt	7320
gatccggcaa acaaaccacc gctggtagcg gtgggttttt tgtttgcaag cagcagatta	7380
cgcgagaaaa aaaaggatct caagaagatc ctttgatctt ttctacgggg tctgacgctc	7440
agtggaacga aaactcacgt taagggattt tggatcatgag attatcaaaa aggatcttca	7500
cctagatcct tttaaattaa aaatgaagtt ttaaataaat ctaaagtata tatgagtaaa	7560
cttggtctga cagttaccaa tgcttaata gtaggcacc tatctcagcg atctgtctat	7620
ttcgttcatc catagttgcc tgactccccg tcgtgtagat aactacgata cgggagggct	7680
taccatctgg cccagtgct gcaatgatac cgcgagacc acgctcaccg gctccagatt	7740
tatcagcaat aaaccagcca gccggaagg ccgagcgag aagtggctct gcaactttat	7800
ccgcctccat ccagtctatt aattggtgcc gggaagctag agtaagtagt tcgccagtta	7860
atagtttgcg caacgttggt gccattgctg caggcatcgt ggtgtcacgc tcgtcgtttg	7920
gtatggcttc attcagctcc ggttcccaac gatcaaggcg agttacatga tccccatgt	7980
tgtgcaaaaa agcgggttagc tccttcgggtc ctccgatcgt tgtcagaagt aagttggccg	8040
cagtgttatc actcatggtt atggcagcac tgcataattc tcttactgtc atgccatccg	8100
taagatgctt ttctgtgact ggtgagtact caaccaagtc attctgagaa tagtgtatgc	8160
ggcgaccgag ttgctcttgc ccggcgtcaa cacgggataa taccgcgcca catagcagaa	8220
ctttaaaagt gctcatcatt ggaaaacgtt cttcggggcg aaaactctca aggatcttac	8280
cgctgttgag atccagttcg atgtaaccca ctctgtcacc caactgatct tcagcatctt	8340
ttactttcac cagcgtttct gggtagagcaa aaacaggaag gcaaaatgcc gcaaaaaagg	8400
gaataagggc gacacggaaa tggtgaatac tcataactctt cttttttcaa tattattgaa	8460

gcatttatca gggttattgt ctcatgagcg gatacatatt tgaatgtatt tagaaaaata 8520
aacaaatagg gggtccgcgc acatttcccc gaaaagtgcc acctgacgtc taagaaacca 8580
ttattatcat gacattaacc tataaaaata ggcgtatcac gaggcccttt cgtcttcaag 8640
aatt 8644

<210> 4
<211> 91
<212> DNA
<213> Artificial sequence

<220>
<223> Primer p920mrgaF2

<400> 4
ctgaggccaa ttaggccaag tttattcttg acattagga acatgcatga tataataggt 60
aaagtaaaca gatcacaagg aggacgttat c 91

<210> 5
<211> 34
<212> DNA
<213> Artificial sequence

<220>
<223> Primer MBmrgaR2

<400> 5
tgaaggatcc acggtccag cagacagaaa gcag 34

<210> 6
<211> 49
<212> DNA
<213> Artificial sequence

<220>
<223> Promoter P920

<400> 6
aagtttattc ttgacattag ggaacatgca tgatataata ggtaaagta 49

<210> 7
<211> 642
<212> DNA
<213> Artificial sequence

<220>
<223> PCR product of promoter 920 and mrgA

<400> 7
ctgaggcctt aaggccaag tttattcttg acattagga acatgcatga tataataggt 60

aaagtaaaca gatcacaagg aggacgttat cttatgaaaa ctgaaaacgc aaaaacaaat 120
 caaacattag ttgagaattc actgaacaca caattatcaa actggtttct tttatactct 180
 aagctccacc gtttccattg gtatgtgaaa gggcctcatt tctttacatt gcacgagaaa 240
 tttgaagaac tttatgacca tgcggctgaa acagtggata ccatcgctga gcgcctgctg 300
 gcgattggcg gacagcctgt tgccacagtg aaagaataca ctgagcatgc atctatcaca 360
 gacggcggaa acgaaacatc agcatcagaa atgggtacaag cattggtaaa cgactacaaa 420
 caaatcagca gcgaatctaa attcgtgatc ggcctggctg aagaaaatca agacaatgcg 480
 acagcggact tgtttgtcgg attaattgaa gaagttgaaa aacaagtgtg gatgctttcc 540
 tcttatttag ggtaacaaaa aagctgaacc ttaatcgggt tcagcttttt gttttttctt 600
 agcttgaact gctttctgtc tgcttgacgc gtggatcctt ca 642

<210> 8
 <211> 91
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Primer p740mrgaF2

<400> 8
 ctgaggccaa ttaggcccg aagtttggtg acacagctcc aggatacaaa tataatgggt 60
 cgactaaaca gatcacaagg aggacgttat c 91

<210> 9
 <211> 49
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Promoter P740

<400> 9
 cggaagtgtg ttgacacagc tccaggatac aaatataatg ggtcgagta 49

<210> 10
 <211> 642
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR product of promoter 740 and mrgA

<400> 10

ctgaggcctt aagggcccgg aagtttggtg acacagctcc aggatacaaa tataatgggt 60
 cgagtaaaca gatcacaagg aggacgttat cttatgaaaa ctgaaaacgc aaaaacaaat 120
 caaacattag ttgagaattc actgaacaca caattatcaa actggtttct ttataactct 180
 aagctccacc gtttccattg gtatgtgaaa ggcctcatt tctttacatt gcacgagaaa 240
 tttgaagaac tttatgacca tgcggctgaa acagtggata ccatcgctga gcgcctgctg 300
 gcgattggcg gacagcctgt tgccacagtg aaagaatata ctgagcatgc atctatcaca 360
 gacggcggaa acgaaacatc agcatcagaa atgggtacaag cattggtaaa cgactacaaa 420
 caaatcagca gcgaatctaa attcgtgatc ggcttggctg aagaaaatca agacaatgcg 480
 acagcggact tgtttgtcgg attaattgaa gaagttgaaa aacaagtgtg gatgctttcc 540
 tcttatttag ggtaacaaaa aagctgaacc ttaatcgggt tcagcttttt gttttttctt 600
 agcttgaact gctttctgtc tgcttgacgc gtggatcctt ca 642

<210> 11
 <211> 91
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Primer p726mrgaF2

<400> 11
 ctgaggccaa ttaggccgag gtgagatttg aactagtag gctacgggac tataatgcgg 60
 gaagtaaaca gatcacaagg aggacgttat c 91

<210> 12
 <211> 49
 <212> DNA
 <213> Artificial sequence

<220>
 <223> Promoter P726

<400> 12
 gaggtgagat ttgacactag taggctacgg gactataatg cgggaagta 49

<210> 13
 <211> 642
 <212> DNA
 <213> Artificial sequence

<220>
 <223> PCR product of promoter P726 and mrgA

<400> 13
ctgaggcctt aagggccgag gtgagatttg acactagtag gctacgggac tataatgcgg 60
gaagtaaaca gatcacaagg aggacgttat cttatgaaaa ctgaaaacgc aaaaacaaat 120
caaacattag ttgagaattc actgaacaca caattatcaa actggtttct tttatactct 180
aagctccacc gtttccattg gtatgtgaaa gggcctcatt tctttacatt gcacgagaaa 240
tttgaagaac tttatgacca tgcggctgaa acagtggata ccatcgctga gcgcctgctg 300
gcgattggcg gacagcctgt tgccacagtg aaagaatata ctgagcatgc atctatcaca 360
gacggcggaa acgaaacatc agcatcagaa atggtacaag cattggtaaa cgactacaaa 420
caaatcagca gcgaatctaa attcgtgatc ggcctggctg aagaaaatca agacaatgcg 480
acagcggact tgtttgtcgg attaatgaa gaagttgaaa aacaagtgtg gatgctttcc 540
tcttatttag ggtaacaaaa aagctgaacc ttaatcgggt tcagcttttt gttttttctt 600
agcttgaact gctttctgtc tgcttgacgc gtggatcctt ca 642

<210> 14
<211> 88
<212> DNA
<213> Artificial sequence

<220>
<223> Primer AN162

<400> 14
agactgtccg cggtgtaaaa aataggaata aagggggggtt gacattattt tactgatatg 60
tataatataa tttgtataag aaaatgag 88

<210> 15
<211> 32
<212> DNA
<213> Artificial sequence

<220>
<223> Primer AN163c

<400> 15
gcatacacgc gttgtcacac ctgatgccga cc 32

<210> 16
<211> 8152
<212> DNA
<213> Artificial sequence

<220>
<223> Plasmid pAN213ban

<400> 16

ccgcggtgta	aaaaatagga	ataaaggggg	gttgacatta	ttttactgat	atgtataata	60
taatttgtat	aagaaaatga	gagggagagg	aaacatgatt	caaaaacgaa	agcggacagt	120
ttcgttcaga	cttgtgctta	tgtgcacgct	gttatttgtc	agtttgccga	ttacaaaaac	180
atcagccgta	aatggcacgc	tgatgcagta	ttttgaatgg	tatacgccga	acgacggcca	240
gcattggaaa	cgattgcaga	atgatgcgga	acatttatcg	gatatcgga	tcactgccgt	300
ctggattcct	cccgcataca	aaggattgag	ccaatccgat	aacggatacg	gaccttatga	360
tttgtatgat	ttaggagaat	tccagcaaaa	agggacggtc	agaacgaaat	acggcacaaa	420
atcagagctt	caagatgcga	tcggctcact	gcattcccgg	aacgtccaag	tatacggaga	480
tgtggttttg	aatcataagg	ctgggtgctga	tgcaacagaa	gatgtaactg	ccgtcgaagt	540
caatccggcc	aatagaaatc	aggaaacttc	ggaggaatat	caaatacaag	cgtggacgga	600
ttttcgtttt	ccgggccgtg	gaaacacgta	cagtgatttt	aaatggcatt	ggtatcattt	660
cgacggagcg	gactgggatg	aatcccggaa	gatcagccgc	atctttaagt	ttcgtgggga	720
aggaaaagcg	tgggattggg	aagtatcaag	tgaaaacggc	aactatgact	atttaatgta	780
tgctgatgtt	gactacgacc	accctgatgt	cgtggcagag	acaaaaaaat	ggggtatctg	840
gtatgcgaat	gaactgtcat	tagacggctt	ccgtattgat	gccgcaaac	atattaaatt	900
ttcatttctg	cgtgattggg	ttcaggcggg	cagacaggcg	acgggaaaag	aatgttttac	960
ggttgcggag	tattggcaga	ataatgccgg	gaaactcgaa	aactacttga	ataaaaacaag	1020
ctttaatcaa	tccgtgtttg	atgttccgct	tcatttcaat	ttacaggcgg	cttcctcaca	1080
aggaggcgga	tatgatatga	ggcgtttgct	ggacgggtacc	gttgtgtcca	ggcatccgga	1140
aaaggcgggt	acatttgttg	aaaatcatga	cacacagccg	ggacagtcac	tggaatcgac	1200
agtccaaact	tgggtttaa	cgccttgata	cgcctttatt	ttgacaagag	aatccggtta	1260
tcctcaggtg	ttctatgggg	atatgtacgg	gacaaaagg	acatcgccaa	aggaaattcc	1320
ctcactgaaa	gataatatag	agccgatttt	aaaagcgcgt	aaggagtacg	catacggggc	1380
ccagcacgat	tatattgacc	acccggatgt	gatcggatgg	acgagggaag	gtgacagctc	1440
cgccgcaaaa	tcaggtttgg	ccgctttaat	cacggacgga	cccggcggat	caaagcggat	1500
gtatgccggc	ctgaaaaatg	ccggcgagac	atggatgac	ataacgggca	accgttcaga	1560
tactgtaaaa	atcgatctg	acggctgggg	agagtttcat	gtaaacgatg	ggtccgtctc	1620
catttatgtt	cagaaataag	gtaataaaaa	aacacctcca	agctgagtgc	gggtatcagc	1680

ttggagggtgc gtttattttt tcagccgtat gacaagggtcg gcatcagggtg tgacaacgcg	1740
tgatccagac cagttccctg agcttccgtc agtcggatcc cattgcggaa aatagtcata	1800
ggcatcctgg aattcaatgt tgcaataat gacgttatca ctcttgattt ggaagtttcc	1860
tcccacgact ttagcgtag tccctgaacc gacgatcgtc gtgtttgcag ggatatccac	1920
catgaccctg gctttttggg ttttctgaga gcgtgctctc gcttcttctt gtgttcccga	1980
cggctctttt ttgccccatg tgctaggatc ataggctttc aaatatttgt ccaaatacata	2040
ctccggatct ttatagtcac ttaggccaag cggcttcaga ttgtcatcca cgttcacgtc	2100
aatcgttccc ttgatataaa tgatttttgg cgttggtgtc gtttccttcc ctaatgccga	2160
gacaagctgg tttctgttgc tgacggtata cacatttgag gaggatgctt ttgatccgcc	2220
tgctcgtgccg gtcgagtacg cgtcccgacc atcattggat cccaacgtct ggtggcctaa	2280
atcagctgcg ttcgcgccag ctggagtcaa tcctaaaaac aaagccgtag ctaacatcaa	2340
aagggcctcg tgatacgctt atttttatag gttaatgtca tgataataat ggtttcttag	2400
acgtcagggtg gcacttttgc gggaaatgtg cgcggaaccc ctatttgttt atttttctaa	2460
atacattcaa atatgtatcc gctcatgaga caataaccct gataaatgct tcaataatat	2520
tgaaaaagga agagtatgag tattcaacat ttccgtgtcg cccttattcc cttttttgcg	2580
gcattttgcc ttctgtttt tgctcaccca gaaacgctgg tgaaagtaaa agatgctgaa	2640
gatcagttgg gtgcacgagt gggttacatc gaactggatc tcaacagcgg taagatcctt	2700
gagagttttc gccccgaaga acgttttcca atgatgagca cttttaaaagt tctgctatgt	2760
ggcgcggtat tatcccgtgt tgacgccggg caagagcaac tcggtcgcgg catacactat	2820
tctcagaatg acttggttga gtactcacca gtcacagaaa agcatcttac ggatggcatg	2880
acagtaagag aattatgcag tgctgccata accatgagtg ataacactgc ggccaactta	2940
cttctgacaa cgatcggagg accgaaggag ctaaccgctt ttttgacaaa catgggggat	3000
catgtaactc gccttgatcg ttgggaaccg gagctgaatg aagccatacc aaacgacgag	3060
cgtgacacca cgatgcctgc agcaatggca acaacgttgc gcaaactatt aactggcgaa	3120
ctacttactc tagcttcccc gcaacaatta atagactgga tggaggcgga taaagttgca	3180
ggaccacttc tgcgctcggc ccttccggct ggctggttta ttgctgataa atctggagcc	3240
ggtgagcgtg ggtctcgcgg tatcattgca gactggggc cagatggtaa gccctcccgt	3300
atcgtagtta tctacacgac ggggagtcag gcaactatgg atgaacgaaa tagacagatc	3360

gctgagatag	gtgcctcact	gattaagcat	tggttaactgt	cagaccaagt	ttactcatat	3420
atacttttaga	ttgattttaa	acttcatttt	taattttaaa	ggatctaggt	gaagatcctt	3480
tttgataatc	tcatgaccaa	aatcccttaa	cgtgagtttt	cgttccactg	agcgtcagac	3540
cccgtagaaa	agatcaaagg	atcttcttga	gacccctttt	ttctgcgcgt	aatctgctgc	3600
ttgcaaacia	aaaaaccacc	gctaccagcg	gtggtttggt	tgccggatca	agagctacca	3660
actctttttc	cgaaggtaac	tggtctcagc	agagcgcaga	taccaaatac	tgtccttcta	3720
gtgtagccgt	agttaggcca	ccacttcaag	aactctgtag	caccgcctac	atacctcgct	3780
ctgctaatac	tgttaccagt	ggctgctgcc	agtggcgata	agtcgtgtct	taccgggttg	3840
gactcaagac	gatagttacc	ggataaggcg	cagcggtcgg	gctgaacggg	gggttcgtgc	3900
acacagccca	gcttgagagc	aacgacctac	accgaactga	gataacctaca	gcgtgagcta	3960
tgagaaaagc	ccacgcttcc	cgaagggaga	aaggcggaca	ggtatccggt	aagcggcagg	4020
gtcggaaacag	gagagcgcac	gagggagctt	ccagggggaa	acgcctggta	tctttatagt	4080
cctgtcgggt	ttcgccacct	ctgacttgag	cgctcgattt	tgtgatgctc	gtcagggggg	4140
cggagcctat	ggaaaaacgc	cagcaacgcg	gcccgcctc	gagctggata	cttcccgtcc	4200
gccaggggga	catgccggcg	atgctgaagg	tcgcgcgcac	tcccgatgaa	gaggccggtt	4260
accgcctggt	tgaggatata	gtaatctttc	taaatagctt	tggattggag	gagtatgggg	4320
agatcaggga	atgagtttat	aaaataaaaa	aagcacctga	aaaggtgtct	ttttttgatg	4380
gttttgaaact	tgttctttct	tatcttgata	catatagaaa	taacgtcatt	tttatttttag	4440
ttgctgaaaag	gtgcgttgaa	gtgttggtat	gtatgtgttt	taaagtattg	aaaaccctta	4500
aaattgggtg	cacagaaaaa	ccccatctgt	taaagttata	agtgactaaa	caaataacta	4560
aatagatggg	ggtttctttt	aatattatgt	gtcctaatag	tagcatttat	tcagatgaaa	4620
aatcaagggt	tttagtggac	aagacaaaaa	gtggaaaagt	gagaccatga	tgcttaggaa	4680
gacgagttat	taatagctga	ataagaacgg	tgctctccaa	atattcttat	ttagaaaagc	4740
aaatctaaaa	ttatctgaaa	agggaatgag	aatagtgaat	ggaccaataa	taatgactag	4800
agaagaaaga	atgaagattg	ttcatgaaat	taaggaacga	atattggata	aatatgggga	4860
tgatgttaag	gctattgggt	tttatggctc	tcttggctgt	cagactgatg	ggccctattc	4920
ggatattgag	atgatgtgtg	tcatgtcaac	agaggaagca	gagttcagcc	atgaatggac	4980
aaccggtgag	tggaagggtg	aagtgaattt	tgatagcgaa	gagattctac	tagattatgc	5040
atctcagggt	gaatcagatt	ggccgcttac	acatgggtcaa	tttttctcta	ttttgccgat	5100

ttatgattca ggtggatact tagagaaagt gtatcaaact gctaaatcgg tagaagccca	5160
aacgttccac gatgcgattt gtgcccttat cgtagaagag ctgtttgaat atgcaggcaa	5220
atggcgtaat attcgtgtgc aaggaccgac aacatttcta ccatccttga ctgtacaggt	5280
agcaatggca ggtgccatgt tgattgggtct gcatcatcgc atctgttata cgacgagcgc	5340
ttcggctctta actgaagcag ttaagcaatc agatcttcct tcagggttatg accatctgtg	5400
ccagttcgtat atgtctgggtc aactttccga ctctgagaaa cttctggaat cgctagagaa	5460
tttctggaat gggattcagg agtggacaga acgacacgga tatatagtgg atgtgtcaaa	5520
acgcatacca ttttgaacga tgacctctaa taattgttaa tcatgttggt tacgtattta	5580
ttaacttctc ctagtattag taattatcag cggtccctact aatactaagt tcagctaata	5640
aaaaaatttg ctaaagaact ccagctggat ttcactgatg agaatatcgt cgagataaaa	5700
tataataatt ccacggacta tagactatac tagtatactc cgtctactgt acgatacact	5760
tccgctcagg tccttgtcct ttaacgagga ttgttaccga ctaagaaaat gccgtcaaat	5820
ccgctcgcca tgacttcacg tcgacccgca cccgcttgat ttataacatt tgatttcaca	5880
ttagcagaag catcaatcga tccatgcaga gacggcgtcc agccgacaga agagctcagc	5940
ccgtttgcag ccgatgcgtt gatctgtgtg ccgttcagca acgtgccgga gtcataataa	6000
gccgttcccc cgctgaatac gctgatcgtt ttagcagctg acagtcccgg tacgtcaatg	6060
acattgtttt gggcatagat tttagatgac tttccgattc cccatgcata gctaaaagga	6120
taacttgaag agcttgtgct tccttcataa tagttgttgt atacgtgcac ttgcccgaag	6180
cggactctcg gcgcgcgctg gacaatattt ttatagcggc tatgatgcag cgtaattttt	6240
aatttgccgt catcggagggt tttgctgtca cttgatccga aaatggagct tttatcatga	6300
tcgtgataat agttgtagga catcgtgata tagttagcac cgttggaagc atccgtttgg	6360
ccgtcatggg gctgatattt tcttcataa tatttcggtg atgtgctgtc cggacgcgaa	6420
ccgtgtcggc gatataggcg ccagcaaccg cacctgtggc gccggtgatg ccggccacga	6480
tgcgccggc gtagaggatc tggagctgta atataaaaac cttcttcaac taacggggca	6540
ggtagtgac attagaaaac cgactgtaaa aagtacagtc ggcattatct catattataa	6600
aagccagtca ttaggcctat ctgacaattc ctgaatagag ttcataaaca atcctgcatg	6660
ataaccatca caaacagaat gatgtacctg taaagatagc ggtaaatata ttgaattacc	6720
tttattaatg aattttcctg ctgtaataat gggtagaagg taattactat tattattgat	6780

atttaagtta aaccagtaa atgaagtcca tggttatgtc tttgtatccc gtttgtatta	6840
cttgatcctt taactctggc aaccctcaaa attgaatgag acatgctaca cctccggata	6900
ataaatatat ataaacgtat atagatttca taaagtctaa cacactagac ttatttactt	6960
cgtaattaag tcgttaaacc gtgtgctcta cgaccaaaac tataaaacct ttaagaactt	7020
tcttttttta caagaaaaaa gaaattagat aaatctctca tatcttttat tcaataatcg	7080
catccgattg cagtataaat ttaacgatca ctcatcatgt tcatatttat cagagctcgt	7140
gctataatta tactaatttt ataaggagga aaaaatatgg gcatttttag tatttttgta	7200
atcagcacag ttcattatca accaaacaaa aaataagtgg ttataatgaa tcgttaataa	7260
gcaaaattca tataaccaa ttaaagaggg ttataatgaa cgagaaaaat ataaaacaca	7320
gtcaaaactt tattacttca aaacataata tagataaaat aatgacaaat ataagattaa	7380
atgaacatga taatatcttt gaaatcggct caggaaaagg ccattttacc cttgaattag	7440
taaagagggtg taatttcgta actgccattg aaatagacca taaattatgc aaaactacag	7500
aaaataaact tgttgatcac gataatttcc aagtttttaa caaggatata ttgcagttta	7560
aatttcctaa aaaccaatcc tataaaatat atggtaatat accttataac ataagtacgg	7620
atataatacg caaaattggt tttgatagta tagctaata gatttattta atcgtggaat	7680
acgggtttgc taaaagatta ttaaatacaa aacgctcatt ggcattactt ttaatggcag	7740
aagttgatat ttctatatta agtatggttc caagagaata ttttcatcct aaacctaaag	7800
tgaatagctc acttatcaga ttaagtagaa aaaaatcaag aatatcacac aaagataaac	7860
aaaagtataa ttatttcggt atgaaatggg ttaacaaaga atacaagaaa atatttacia	7920
aaaatcaatt taacaattcc ttaaaacatg caggaattga cgatttaaac aatattagct	7980
ttgaacaatt cttatctctt ttcaatagct ataaattatt taataagtaa gttaagggat	8040
gcataaaactg catcccctaa cttgtttttc gtgtgcctat tttttgtgaa tcgacctgca	8100
ggcatgcaag ctttttcaat tcatccgtca cagtctcagg atgattgatc ac	8152